

How risky is the new era of nuclear power?

By Paul Davidson, USA TODAY, 12/12/2007

Nearly two years ago, the Nuclear Regulatory Commission gave the operator of the Indian Point nuclear plant a year to add backup power supplies to the plant's emergency warning sirens. Entergy paid a \$130,000 government fine in April — but still hasn't done the work at the plant 24 miles north of New York City.

At the Peach Bottom nuclear plant south of Harrisburg, Pa., security guards often took 15-minute "power naps," according to a letter from a former security manager to the NRC last March. The NRC began investigating after CBS News aired video of the dozing guards in early September.

Neither of the incidents amounted to an "immediate" safety risk, the NRC says. But they — and hundreds of other seemingly minor episodes at nuclear power plants in recent years — are drawing increased scrutiny as the USA prepares to launch a new generation of nuclear reactors.

NUCLEAR SAFETY PROBLEMS: A sampling since the Three Mile Island accident
Power companies are beginning to file applications to build up to 32 nuclear plants over the next 20 years, the first since the 1979 accident at the Three Mile Island plant in Pennsylvania halted plans for new reactors and led to sweeping changes in safety regulations. It's partly a reflection of how, amid concerns about climate change, communities have become more open to nuclear power as a cleaner alternative to pollution-belching coal-fired plants.

Critics and advocates of nuclear power generally agree that improvements in equipment and employee training have helped to make nuclear plants safer since the partial meltdown of a reactor at Three Mile Island.

Watchdog groups, however, say that unless nuclear safety and security improve, the USA's expansion of its nuclear power industry — which now involves 104 reactors that supply about 20% of the nation's electricity — could pose risks to nearby communities.

"Serious safety problems" plague U.S. nuclear plants because the NRC isn't adequately enforcing its standards and has cut back on inspections, according to a report released Tuesday by the Union of Concerned Scientists (UCS), a nuclear safety watchdog group.

The report also says that even though security at nuclear plants was increased after the Sept. 11 terrorist attacks, reactors still aren't sufficiently protected against terrorist threats such as hijacked jets, and new reactors aren't being designed to be significantly safer than existing ones. Increasing the number of reactors without creating "unacceptably high safety and security risks" could be difficult, the report concludes.

There has been no meltdown of a reactor in the USA since the incident at Three Mile Island, which led to no deaths or identifiable injuries from radiation exposure but resulted in the release of some radiation from the plant.

However, since 1979, U.S. nuclear plants have had to shut down 46 times for a year or more, in most cases to fix equipment problems that accumulated over time and that regulators should have ordered repaired earlier, according to the UCS, which compiled the data from the NRC and other research. And the number of equipment failings that increase the risk of an accident is up since 2001, compared with the previous five-year period, NRC figures show.

The UCS says incidents such as occasional failures of pumps that cool the nuclear reactor core in an emergency eventually could prove disastrous if they coincide with other low-probability events, such as coolant leakages from the core.

"The track record on existing reactors leaves much to be desired, and until you fix that problem, it's going to carry over to new reactors," says David Lochbaum, director of UCS' nuclear safety project.

The NRC and the Nuclear Energy Institute (NEI), the industry's trade group, say just one incident since Three Mile Island — a water leak at the Davis-Besse plant in Ohio in 2002 — has come close to threatening communities near any plant.

The NRC says that in the episode involving the sleeping guards at Peach Bottom, it didn't act sooner because it couldn't substantiate the claims with Exelon (EXC), the plant's operator. At Indian Point, Entergy (ETR) says its plan to install backup power for the sirens has been delayed by technical hurdles and the need to get permits from dozens of towns, counties and state offices.

A 'reliable fleet of reactors'

Nuclear reactors generate heat that produces electricity when uranium atoms split. In the reactor core, uranium is kept in water to prevent it from overheating, melting down and releasing radiation.

A meltdown by itself typically would not be disastrous because the reactor sits in a concrete containment structure to prevent radiation from escaping.

However, a meltdown could cause a buildup of temperature and pressure that ruptures the containment building. A massive release of radioactive gas into a surrounding community could destroy or damage human cells and cause death or cancer.

That's what happened at the Chernobyl nuclear plant in the former Soviet Union in 1986. The world's worst nuclear plant disaster involved a meltdown and an explosion that killed 56 people. At least an additional 4,000 are projected to die from cancer because of exposure to radiation.

In the accident at Three Mile Island seven years earlier, water cooling the core in one of the plant's two reactors leaked through a partly open valve. The valve was closed enough to prevent an alarm from sounding. Half the core melted, but the containment building stopped all but a small amount of radiation from seeping into the environment.

The incident led the U.S. government to require upgrades in piping, valves and other equipment at all nuclear plants, and NRC inspections were increased.

Today, "The U.S. operates not only the biggest but probably the safest and most reliable fleet of reactors," says NEI Senior Vice President Marvin Fertel.

UCS' Lochbaum counters that the 46 reactor shutdowns during the past three decades indicate there has been a buildup of multiple problems that regulators should have caught sooner.

In 1995, for example, Public Service Electric & Gas had to close its Salem plant in New Jersey for three years until 43 equipment problems were fixed, including a broken fan that kept safety gear from overheating.

A Government Accountability Office report said the NRC knew about 38 of the flaws — in two cases for more than six years — and that its "lack of more aggressive action" compounded the plant's problems.

Plants inspected less frequently

In the most serious episode involving a U.S. nuclear plant since Three Mile Island, the Davis-Besse plant in Ohio was shut down from 2002 to 2004 after the NRC failed to spot what it acknowledges were early signs of trouble.

An acid leak through the reactor vessel's lid left a quarter-inch-thick steel veneer, according to NRC reports. Because emergency pumps also were faulty, core-cooling water leaking through the ruptured lid could have led to a meltdown.

The NRC identified the leak in fall 2001 but let the plant keep operating. An NRC Inspector General's report in 2002 found the agency's willingness to keep the plant running "was driven in large part by a desire to lessen the financial impact on (plant operator FirstEnergy) that would result from an early shutdown."

In a statement last month, the NRC blamed FirstEnergy (FE) for providing "inaccurate and misleading information," including its "explanation of the leak."

FirstEnergy says it has made extensive staffing and procedural changes to prevent such situations in the future.

Stuart Richards, deputy director of the NRC's inspection unit, says such shutdowns show "that if the NRC feels plants shouldn't be operating, we'll take appropriate actions."

Richards notes that Davis-Besse was the last plant to be shuttered for at least a year and that similar safety problems have decreased. Plants were shut down an average of 1.5% of the time because of safety lapses in 2006, down from 10% in 1997, NRC figures show.

NRC credits a more precise oversight system, launched in 2000, that increases inspections at poorly performing plants. However, one key safety measure — of problems that the NRC says increase the annual risk of a meltdown from an average of 1 in 17,000 to up to 1 in 1,000 — has doubled the past six years to an average of 18 a year.

There have been 337 such "precursors" since 1988, including failures of pumps that supply water to reactors in a crisis, the NRC says. Each plant's emergency cooling system typically has several backups, such as pumps or power generators.

NRC spokesman Scott Burnell says the increase in such problems is insignificant because 22 of the incidents stemmed from two causes the agency was aware of, rather than a rash of separate problems.

Half the problems stemmed from the loss of power — needed to run critical cooling systems — and most of those occurred during the massive electricity blackout that struck the northeastern USA on Aug. 14, 2003. The other half involved cracks in nozzles that, in some cases, let water seep from a reactor.

Lochbaum says that such explanations by the NRC do not ease his concerns about plants' safety. He blames the increasing "precursors" on scaled-back inspections by the NRC and plant owners.

From 1993 to 2000, routine NRC inspection hours declined by 20%, partly because of budget constraints, the NRC acknowledges.

Although the hours spent inspecting plants rose 11% from 2001 to 2005, most of the increase stemmed from more attention to post-9/11 security checks, rather than the operation of the plants.

NRC and industry officials acknowledge they're inspecting many parts of nuclear plants less frequently since 2000. But they say inspections are more effective because they now focus on critical gear whose failure poses the greatest risk to the public.

Questions about standards

In its report, the UCS says the NRC has not consistently enforced many of its safety regulations for nuclear plants.

The group says that since 1981, for example, the NRC has issued about 1,000 exemptions to plants that failed to meet fire-protection rules that went into effect after a 1975 blaze at the Browns Ferry plant in Alabama.

The NRC says the waivers were granted to older plants that couldn't make certain structural changes such as separating primary and backup safety gear. Waivers permit alternative fire-prevention methods, such as sprinklers or smoke alarms.

NRC Commissioner Gregory Jaczko says the agency should require plants to take more elaborate steps, such as installing fire-resistant power cables as backups to standard sets.

In February 2000, a steam generator tube at the Indian Point plant ruptured, causing a small radiation leak outside the plant. Workers had spotted corrosion in the tube in 1997, but Con Edison, the plant's operator, persuaded the NRC to delay a follow-up inspection slated for June 1999.

An NRC engineer was skeptical of the request, but agency policy discouraged her from asking follow-up questions, an NRC Inspector General's report found later. The tube broke before the next scheduled inspection in 2000.

The NRC says the inspection was delayed because the plant had been shut down for 10 months before the request, leaving little time for the tube to degrade further.

The UCS' Lochbaum largely blames enforcement lapses on an NRC culture he says discourages workers from raising safety issues out of fear of retaliation. A 2002 Inspector General's survey said only 53% of NRC employees "feel it's safe to speak up" at the agency.

The NRC's Richards says, "We emphasize safety as being important and ... that people should raise concerns."

To bolster enforcement, the UCS report urges Congress to require the NRC to recruit managers from outside its ranks to transform the agency's culture.

Another proposal, in a bill by Sen. Bernie Sanders, I-Vt., would allow states to seek an independent safety assessment of a nuclear plant when it seeks a license extension or an increase in power output, or has repeated safety problems.

The UCS also criticizes the NRC for not requiring new reactors to be significantly safer than current ones.

Under a tentative ruling by the agency, new reactors wouldn't have to include features such as double-walled containment structures to withstand aircraft attacks. The NRC this year similarly decided against a proposal to force existing reactors to install giant mesh shields to deflect air attacks.

NRC Deputy Director Gary Holahan says nuclear plants already are "one of the most robust, safest facilities ... against air attacks."

Developers of more than half the 32 planned reactors have chosen two models that use "passive safety" systems. If the core overheats, they rely mostly on a gravity-driven release of water to cool it, rather than on motorized pumps like those in existing reactors. The new systems cut costs and avoid potential breakdowns if power is lost, making them safer than current models, say the NRC and manufacturers Westinghouse and General Electric.

But UCS scientist Edwin Lyman says the new designs' reduced reliance on backup pumps is a concern because their performance in a crisis is less certain. "They're shaving safety margins," he says.

Another point of contention: The NRC plans to have about 30% of its inspections of new reactors done by private contractors as it tries to streamline licensing reviews. Lochbaum worries that safety will be sacrificed in a rush to issue licenses quickly. Many engineers who designed the reactors will be responsible for reviewing them, he says.

But NRC's Holahan says the contractors will simply be providing technical information. "We make the final decisions about whether something is safe," he says.